

### Remarks

Claims 1-32 are pending in the present application and are rejected.

The Specification is amended to replace the “word” invention with “embodiment” at various places in paragraphs [0022], [0023], and [0024]. The appropriateness of this amendment is from the first sentence of paragraph [0022]. Paragraph [0036] is amended to insert “of various embodiments of” after the word “methods”. No new matter is added by these amendments.

The present invention provides a catalyst for use in a NO<sub>x</sub> trap which is optimized to minimize the release of unconverted NO<sub>x</sub> during a rich purge. The catalyst includes a precious metal, an oxygen storage component in contact with the precious metal, and a NO<sub>x</sub> storage material. Advantageously, the oxygen storage component simultaneously limits the NO<sub>x</sub> release from the NO<sub>x</sub> trap during rich purges while increasing the NO<sub>x</sub> conversion efficiency under stoichiometric conditions and sulfur tolerance.

### Claim Rejections Under 35 U.S.C. § 102(b)

Claims 1-32 are rejected under 35 U.S.C. § 102(b) as anticipated by Brisley et al., U.S. Patent No. 6,413,483 B1.

The present invention discloses a catalyst for use in a NO<sub>x</sub> trap with specific limitations regarding oxygen storage capacity. Specifically, independent claim 1 requires:

an oxygen storage component in contact with the precious metal in an amount that provides sufficient oxygen storage capacity to limit the NO<sub>x</sub> release from the NO<sub>x</sub> trap **during rich purges** to less than 20% of the NO<sub>x</sub> that is stored in the NO<sub>x</sub> trap across the operating temperature window of the trap

Claim 1 (emphasis added)

and independent claim 29 requires:

ceria in contact with the precious metal in an amount that provides sufficient oxygen storage capacity to reduce the NO<sub>x</sub> release from the NO<sub>x</sub> trap **during rich purges** to less than 20% of the NO<sub>x</sub> that is stored in the NO<sub>x</sub> trap across the operating temperature window of the NO<sub>x</sub> trap

Claim 29 (emphasis added)

Brisley et al. discloses a 3-layer lean NO<sub>x</sub> trap ("LTN") that selectively promotes the reactions between the reductants in the exhaust (HC, CO) and the gaseous NO<sub>x</sub> or stored NO<sub>x</sub>. As a result, their LNT does not require rich operation to purge any stored NO<sub>x</sub>. Instead, the catalyst of Brisley is continually regenerated while operating at stoichiometric or lean A/F ratios:

A layered exhaust gas catalyst containing Pt in a first layer and Rb in a second layer is more selective for catalyzing the reaction between NO<sub>sub.x</sub> and/or nitrate with hydrocarbons and/or CO than for catalyzing the reaction between hydrocarbons and/or CO with oxygen. NO<sub>sub.x</sub> can be reduced to N<sub>sub.2</sub> under constant lean to stoichiometric conditions **without the need for rich spikes**.

Brisley et al., Abstract

It is clear that Brisley et al. does not teach the limitation required by independent claims 1 and 29 regarding oxygen storage capacity during rich purges. Moreover, this characteristic cannot properly be imputed to Brisley et al. by inherency since such a property must necessarily be present. In the invention of Brisley et al. the oxygen storage capacity is irrelevant and accordingly may have any value.

The amount of oxygen storage material in the LNT of the present invention

is optimized to minimize the release of unconverted  $\text{NO}_x$  during a rich purge. The reaction of the reductants with the oxygen in the oxygen storage capacity materials is exothermic. Due to the decrease in  $\text{NO}_x$  storage capacity with increasing temperature, the increase in the catalyst temperature from this exotherm causes some of the stored  $\text{NO}_x$  to be released without being reduced to  $\text{N}_2$ . For that reason, oxygen storage capacity in the LNT is undesirable. However, cerium provides several benefits, including better 3-way activity at stoichiometry, better sulfur tolerance, and better desulfation capability. For this reason, the level of ceria is optimized to minimize the purge  $\text{NO}_x$  release while providing some of the benefits previously mentioned. The present invention, discloses a maximum oxygen storage capacity level of 60 micromoles of O per gram as measured at  $500^\circ\text{C}$ . The oxygen storage capacity of the optimized LNT would be lower at lower temperatures because the OSC decreases with decreasing temperature. Although the catalyst of Brisley et al. does include cerium, their patent says nothing about optimizing its level. Moreover, Brisley et al. has nothing to do with minimizing purge  $\text{NO}_x$  release, which is the release of  $\text{NO}_x$  during rich operation.

Similarly, claim 16 places the following limitation on the oxygen storage capacity:

an oxygen storage component in contact with the precious metal in an amount such that oxygen storage capacity of the  $\text{NO}_x$  trap at  $500^\circ\text{C}$  is from about 30 micromoles of oxygen per gram of catalyst to about 90 micromoles of oxygen per gram of catalyst

#### Claim 20

Brisley et al. does not disclose the specific ranges of claim 16 for oxygen storage capacity. As explained in the Specification, these ranges are optimized for oxygen storage capacity. Accordingly, these ranges cannot be provided by an inherency argument since these values are not necessarily present in Brisley et al.


Accordingly, for at least these reasons, claims 1-32 are patentable under 35 U.S.C. § 102(b) over Brisley et al.

**Conclusion**

Applicants have made a genuine effort to respond to each of the Examiner's objections and rejections in advancing the prosecution of this case. Applicants believe that all formal and substantive requirements for patentability have been met and that this case is in condition for allowance, which action is respectfully requested. If any additional issues need to be resolved, the Examiner is invited to contact the undersigned at his earliest convenience.

Please charge the one-month extension fee of \$120.00, any additional fees or credit any overpayments as a result of the filing of this paper to Ford Global Technologies, LLC Deposit Account No. 06-1510.

Respectfully submitted,  
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